

## Training report: household modeling with FarmDESIGN

9 – 11 May 2017

Hosted by Royal University of Agriculture, Phnom Penh, Cambodia  
Venue



Contact: Birthe Paul, [B.Paul@cgiar.org](mailto:B.Paul@cgiar.org)

### Objectives of training

1. Familiarize participants with household modeling approaches
2. Introduce FarmDESIGN model and its functionalities
3. Develop and plan own study ideas using FarmDESIGN

### Training agenda

#### Tuesday, 9 May

Time	Activity	Materials
9.00 – 9.15	Welcome by CIAT and RUA, workshop agenda	
9.15 – 9.30	Introduction of participants: Background, experience, motivation, expectations for the training	
9.30 – 10.00	Introduction to farming systems, household modeling approaches and FarmDESIGN (FD)	PPT Birthe
10.00 – 10.30	Presentations of study ideas	PPTs participants
10.30 – 11.00	Coffee break	
11.00 – 12.30	<b>FD basics</b> – demonstration and practice <ul style="list-style-type: none"><li>- File structure, opening the model</li><li>- Existing and new farms</li><li>- Importing, exporting and removing farms</li><li>- Repository</li><li>- Compare farm components</li><li>- Overview of windows</li></ul>	
12.30 – 13.30	Lunch	
13.30 – 15.00	<b>FD data entry</b> – demonstration and practice <ul style="list-style-type: none"><li>- Crops, crop products and rotations</li><li>- Livestock &amp; manures</li><li>- Fertilizers &amp; pesticides</li><li>- Environment &amp; economics</li><li>- Household</li></ul>	Guidelines
15.00 – 15.30	Coffee break	
15.30 – 17.00	<b>Data collection approach and tool</b> <ul style="list-style-type: none"><li>- Approaches to choice of case study farms</li><li>- Overview ImpactLite data collection questionnaire</li><li>- World Café: 4 tables focusing on different parts of the questionnaire, rotating groups</li></ul>	PPT Birthe, empty questionnaire projected and printed

#### Wednesday, 10 May

Time	Activity	Materials
9.00 – 9.15	Recap of day one, questions	
9.30 – 10.30	Examples from Vietnam, Cambodia, Laos using FarmDESIGN	PPTs Birthe, Carole, Damien
10.30 – 11.00	Coffee break	
11.00 – 12.30	<b>FD data transformation &amp; entry</b> <ul style="list-style-type: none"> <li>- Data transformation from questionnaire to FD input</li> <li>- Using the Explain window to improve data entry: destination, manure, labour</li> <li>- Exercise with own farm</li> </ul>	Ea Kar filled questionnaire, calculation sheet
12.30 – 13.30	Lunch	
13.30 – 15.00	<b>FD calibration</b> <ul style="list-style-type: none"> <li>- Import Ea Kar farm, compare to questionnaire</li> <li>- Demonstration of calibration principles: destination, feed balance, OM balance, manure, nutrients, N cycle, labour, profit</li> <li>- Calibrate own farm</li> </ul>	Ea Kar FD file
15.00 – 15.30	Coffee break	
15.30 – 17.00	<b>FD study teams</b> <ul style="list-style-type: none"> <li>- Form teams or work as individuals on FD study ideas</li> <li>- Report back</li> </ul>	

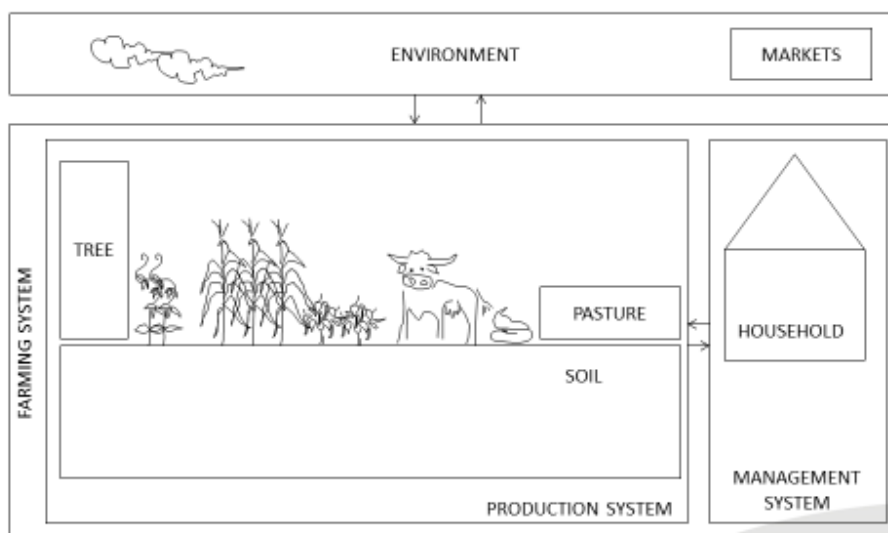
#### **Thursday, 11 May**

Time	Activity	Materials
9.00 – 9.15	Recap of day two, questions	
9.15 – 10.30	<b>FD scenarios and presentation of results</b> <ul style="list-style-type: none"> <li>- Introduction to scenarios</li> <li>- Exporting results</li> <li>- Presentation of results</li> </ul>	Output file
10.30 – 11.00	Coffee break	
11.00 – 12.30	<b>FD presentation of results</b> <ul style="list-style-type: none"> <li>- Practice with Ea Kar and Cu Jut farms – add own farm</li> </ul>	Ea Kar and Cu Jut FD files
12.30 – 13.30	Lunch	
13.30 – 15.00	<b>FD optimization</b> <ul style="list-style-type: none"> <li>- Demonstration of optimization with Ea Kar farm</li> <li>- Interpreting and presenting results</li> <li>- Optimize Cu Jut farm and plot</li> </ul>	
15.00 – 15.30	Coffee break	

15.30 – 16.45	<b>FD study teams and presentations</b> <ul style="list-style-type: none"> <li>- Discuss in study teams: Study objective, choosing farmers, scenarios or optimization approach, planning -&gt; make PPTs Presentation and feedback from other teams</li> </ul>	
16.45 – 17.00	<b>Closure and feedback</b>	

Background – farming systems research, household modeling, trade-offs

## Farming systems research – concepts I



A system is a delimited part of reality with interrelated elements, interacting as a structured functional unit

**Systems thinking:** the whole is different from the sum of the parts

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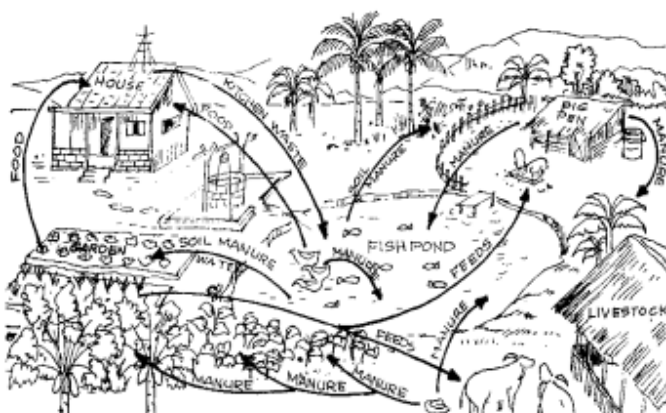


## Farming systems research – concepts II

Between all components there are **flows** – nutrients, material, information

Regulation through **feedbacks**

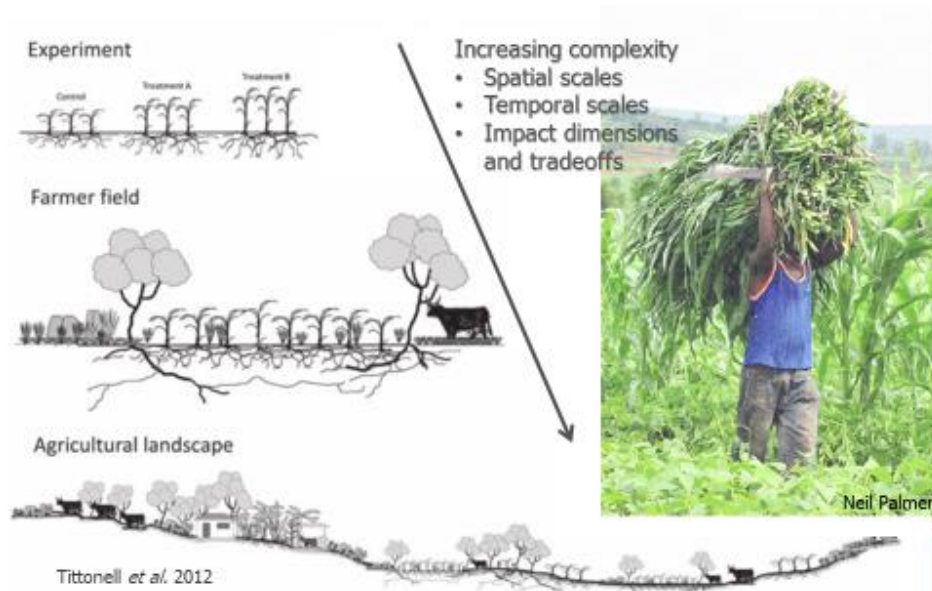
A system is situated within an **environment** (eg market, climate): flows across the boundaries



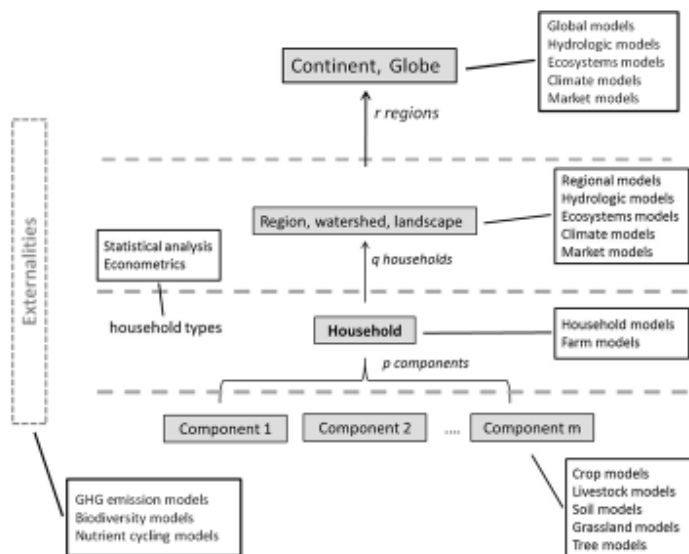
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## Farming systems research - scales



## Farming systems research - models



Van Wijk *et al.*, 2012, CCAFS

**Models** can quantify what we cannot measure/observe, predicting the future

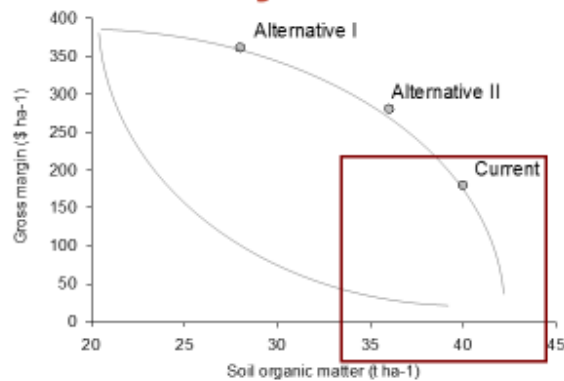
**Hierarchy:** different processes, different levels of application, different time scales, levels nested

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## Trade-off analysis



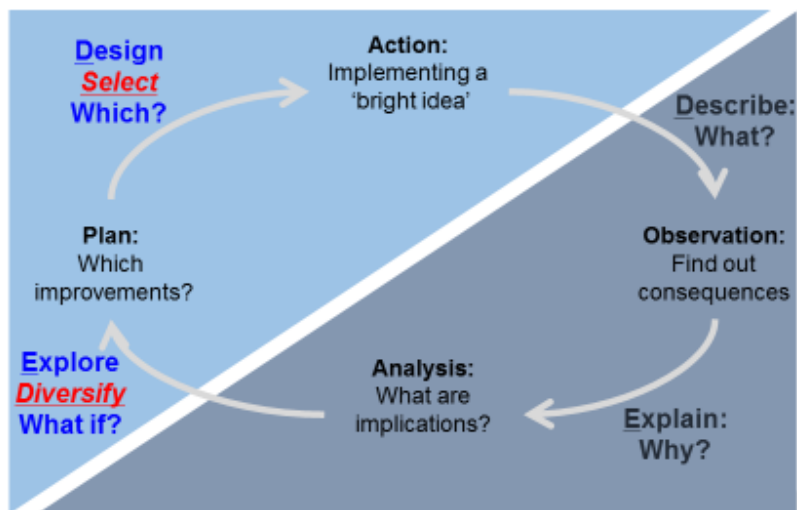
Tittonell *et al.* 2013

- *Why tradeoffs?* Tradeoffs influence adoptability, impact and sustainability of interventions
- *Why household level analysis?* Trade-offs can occur between multiple farm objectives/dimensions
- *Why household modeling?* Simulation can help to explore the potential impacts of technologies and possible futures

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## FarmDESIGN - learning cycles

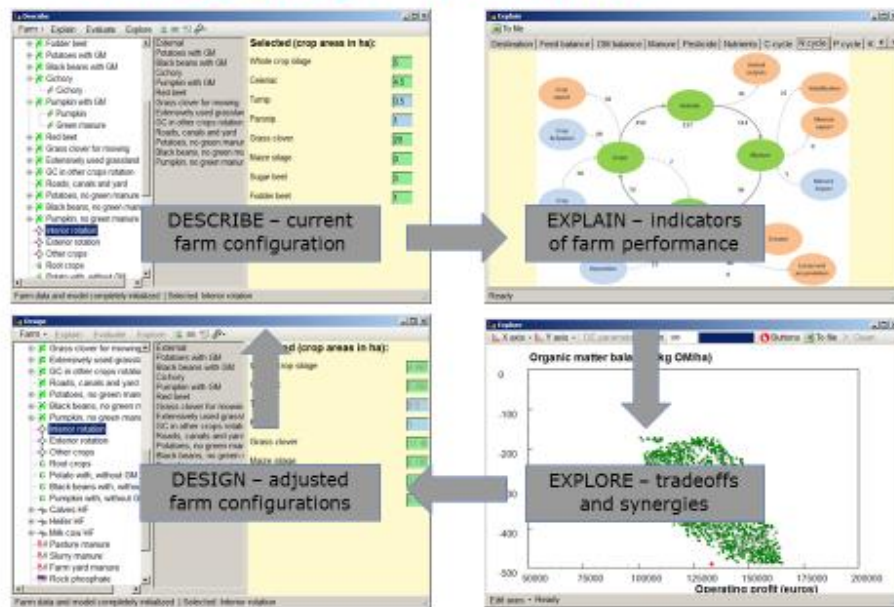


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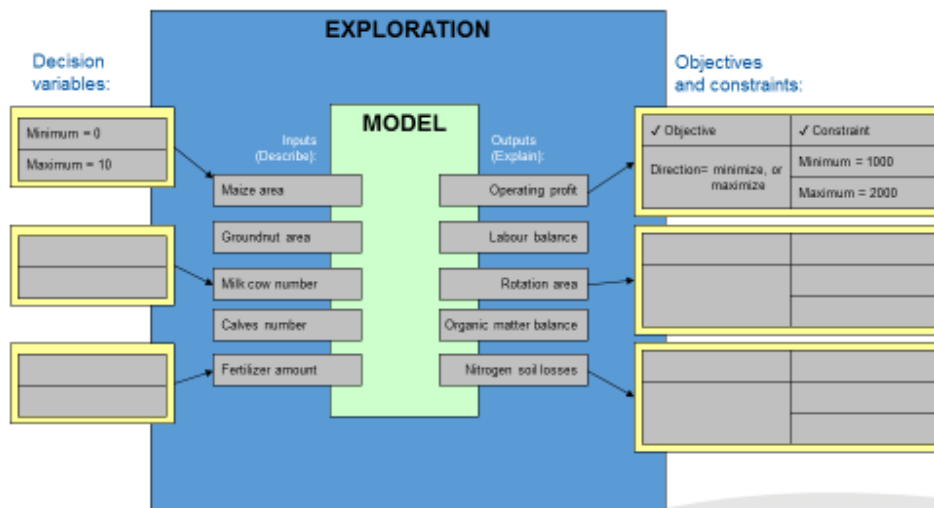


# Farm DESIGN - windows

Groot et al (2012) Agric Syst.



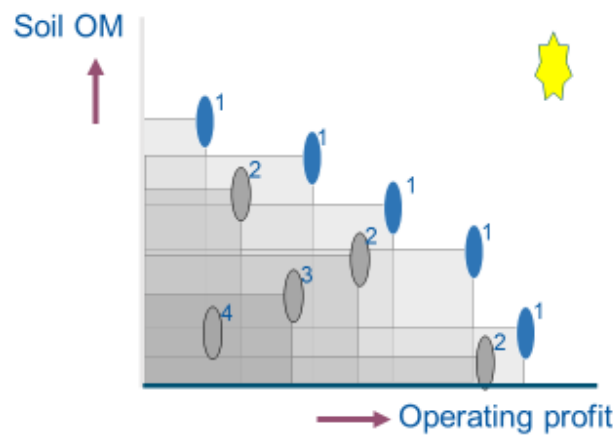
## FarmDESIGN – exploration/optimization



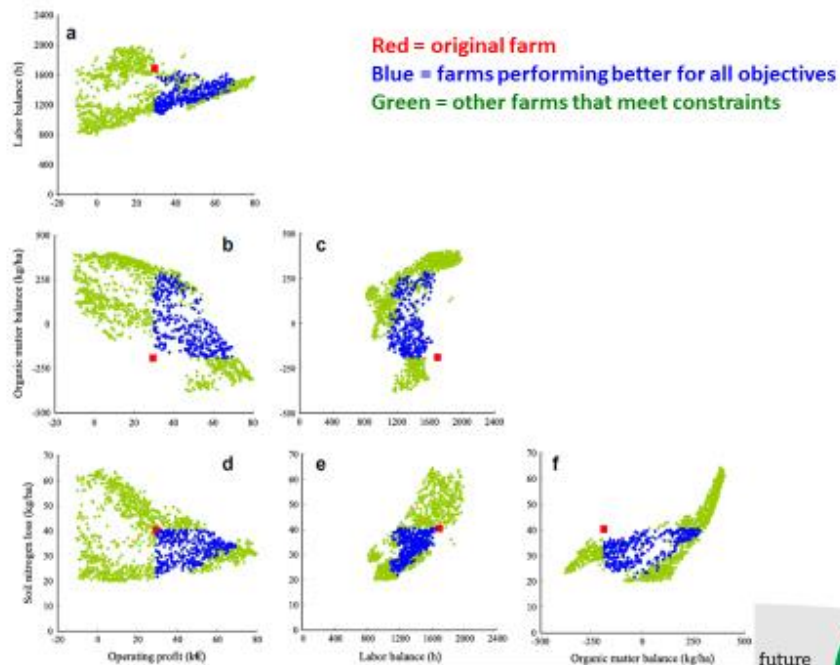
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# FarmDESIGN – pareto-based optimization



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Groot, Oomen & Rossing, 2012. Agricultural Systems



Country study ideas

Laos



## Objectives:

- ▶ Maximize farmers' profit
- ▶ Improve organic matter in the farms
- ▶ Maximize labor surplus
- ▶ Minimize the negative environmental impacts

## Farm types:

Type 1: Manure utilization with animal breeding  
Type 2: Manure utilization without animal breeding.  
Type3: Non-manure utilization with animal breeding.  
Type4: Non-manure utilization without animal breeding.



## Site and group of focus:

- ▶ Kham district: 3 household per type; 12 households with is focused on the poor, the middle and the rich household.
- ▶ Peak district: 3 household per type; 12 households with is focused on the poor, the middle and the rich household.

## Comperation:

- ▶ Between type to type in the district.
- ▶ Between type to type in different district.

## Assumption the suitable scenario:

- ▶ The suitable improving rate in each component with regarding to the 4 main objectives.

## Organic matter and nutrient balance under integrated livestock-crop systems in Cambodia

**Hypothesis:** Quality and quantity of manures are based on animal types and feed sources. Inefficient use of manure and ineffective livestock-crop integration strategy practices may result in OM and nutrient balance deficit in the systems.

**Objective:** to evaluate the OM and nutrient balance under different livestock-crop systems

**Methods:**

- Farm type will be assessed based on difference in livestock-crop integration systems, 2 families per type
- Location : Ratanakiri province
- Using IMPACTLite and FarmDESIGN model,

Farm type	Animal type	Crop type
1	Ruminant	Horticulture - vegetable crop
2	Ruminant	Industrial – cashew crop
3	Ruminant	Field – cassava crop
4	Non-ruminant	Horticulture - vegetable crop
5	Non-ruminant	Industrial – cashew crop
6	Non-ruminant	Field – cassava crop
7	Mixed ruminant and non-ruminant	Horticulture - vegetable crop
8	Mixed ruminant and non-ruminant	Industrial – cashew crop
9	Mixed ruminant and non-ruminant	Field – cassava crop

## Possible Farm Types

Farm type	Animal type	Crop type
1	Ruminant-Cassava	Horticulture - vegetable crop
2	Ruminant-Cassava	Industrial – cashew crop
3	Mixed ruminant - Non-ruminant-cassava	Horticulture - vegetable crop
4	Mixed ruminant-Non-ruminant-Cassava	Industrial – cashew crop

Vietnam

## Vietnamese Team



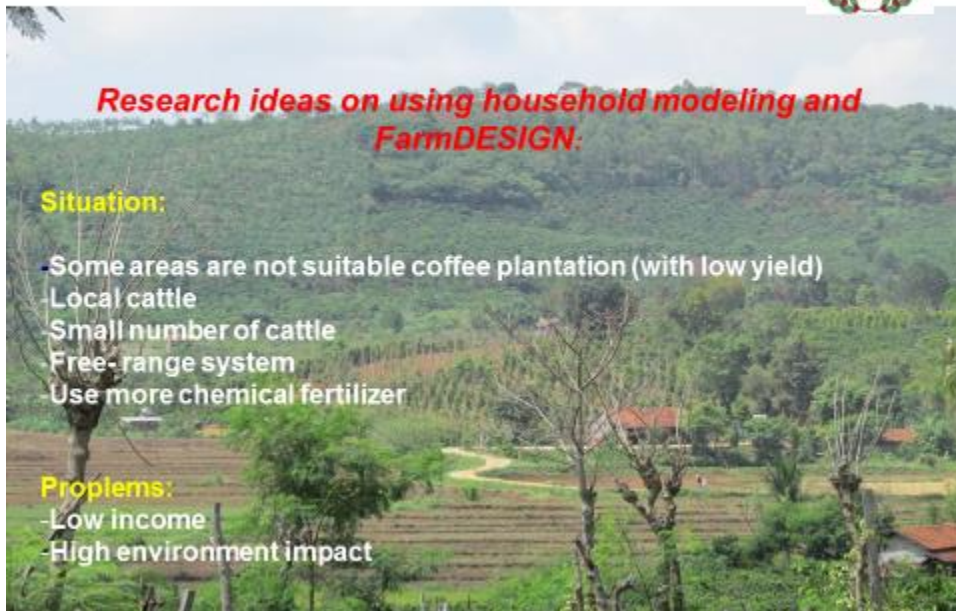
### *Research ideas on using household modeling and FarmDESIGN:*

#### **Situation:**

- Some areas are not suitable coffee plantation (with low yield)
- Local cattle
- Small number of cattle
- Free-range system
- Use more chemical fertilizer

#### **Problems:**

- Low income
- High environment impact



- **Objectives:**

- Increase income
- Reduce greenhouse gas
- Maximize OM

- **Plan to redesign systems:**

- Transfer unsuitable coffee area to forages
- Increase number of livestock
- Shift to Cross-breed cattle
- Cut and carry forage –cattle system



5/14/2017

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## List of participants

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